emotion-detection-nlp

January 6, 2024

[38]:

```
#import necessary library
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import spacy

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.naive_bayes import MultinomialNB
from sklearn.ensemble import RandomForestClassifier

from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.pipeline import Pipeline
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix

import warnings
warnings.filterwarnings('ignore')
```

1 Load The Dataset

[39]:

```
df = pd.read_csv("/kaggle/input/emotiondata/train.txt",sep=";
 ↪",names=["Description","Emotion"])
df.head()
```

[39]:

```
                                         Description  Emotion
0                            i didnt feel humiliated  sadness
1  i can go from feeling so hopeless to so damned…  sadness
2   im grabbing a minute to post i feel greedy wrong    anger
3  i am ever feeling nostalgic about the fireplac…     love
4                               i am feeling grouchy    anger
```

[40]:

```
df['Emotion'].value_counts()
```

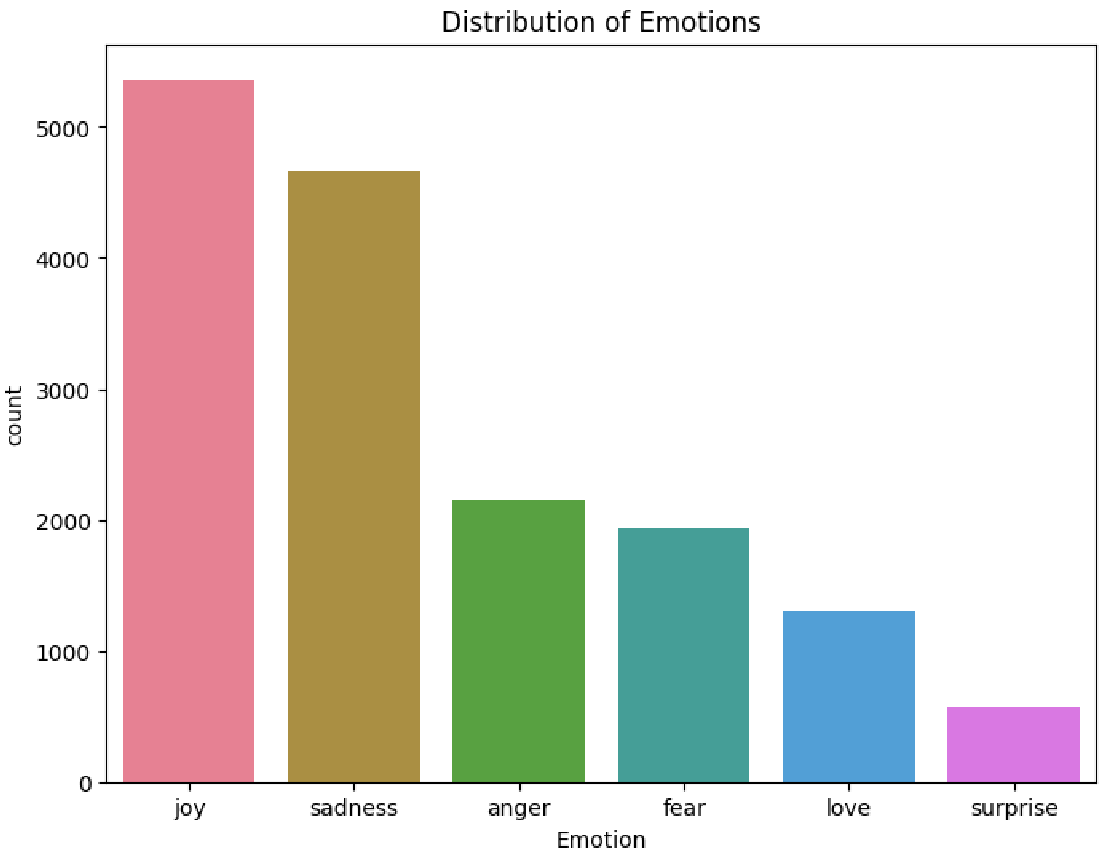
```
[40]: Emotion
      joy         5362
      sadness     4666
      anger       2159
      fear        1937
      love        1304
      surprise     572
      Name: count, dtype: int64
```

1.1 Map emotions to numerical values

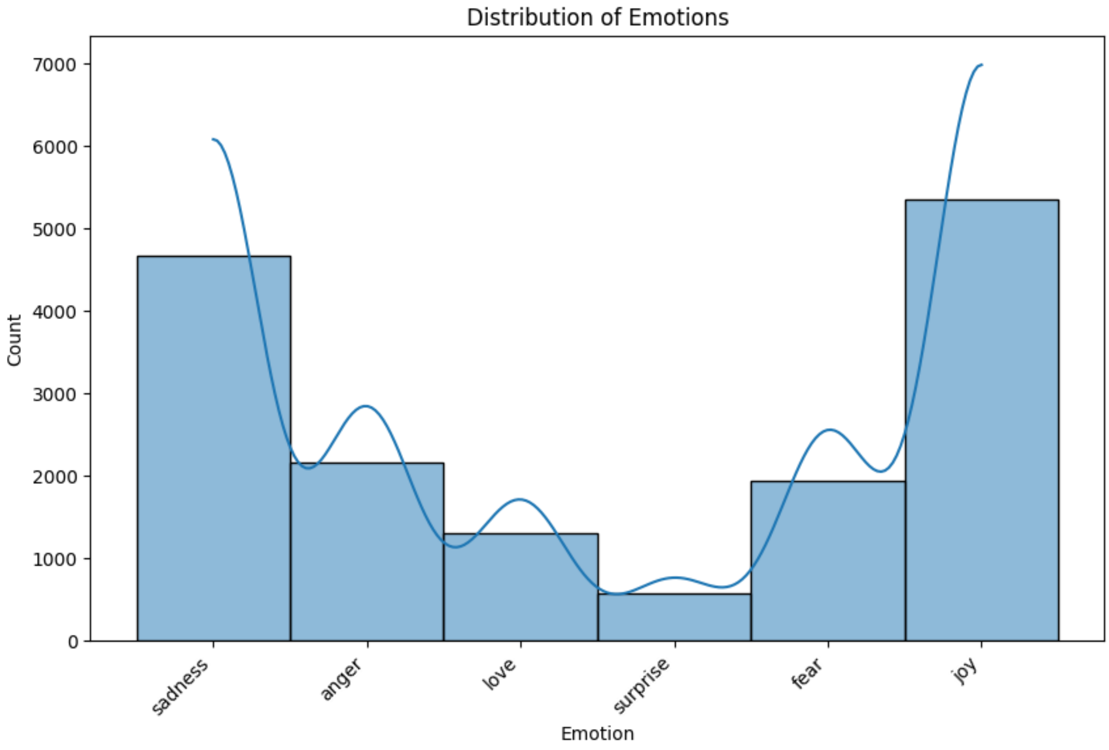
```
[41]: df['Emotion_num'] = df['Emotion'].map({
          'joy' : 0,
          'sadness': 1,
          'anger': 2,
          'fear': 3,
          'love': 4,
          'surprise':5
      })
      df.head()
```

```
[41]:                                          Description  Emotion  Emotion_num
      0                           i didnt feel humiliated  sadness            1
      1  i can go from feeling so hopeless to so damned…  sadness            1
      2   im grabbing a minute to post i feel greedy wrong    anger            2
      3  i am ever feeling nostalgic about the fireplac…     love            4
      4                              i am feeling grouchy    anger            2
```

```
[42]: #Bar plot for emotion distribution
      plt.figure(figsize=(8, 6))
      sns.countplot(x='Emotion', data=df, order=df['Emotion'].value_counts().index,␣
        ↪palette="husl")
      plt.title('Distribution of Emotions')
      plt.show()
```



[43]:
```
# Histogram plot for emotion distribution with KDE
plt.figure(figsize=(10, 6))
sns.histplot(x='Emotion', data=df, kde=True, palette='Set2', element='bars',␣
 ↪stat='count',
             common_norm=False)
plt.title('Distribution of Emotions')
plt.xticks(rotation=45, ha='right')
plt.show()
```



[44]:
```
# Load spaCy English model
nlp = spacy.load("en_core_web_sm")

# Function to preprocess text using spaCy
def preprocess(text):
    doc = nlp(text)
    filtered_tokens = []
    for token in doc:
        if token.is_stop or token.is_punct:
            continue
        else:
            filtered_tokens.append(token.lemma_)
    return " ".join(filtered_tokens)
```

[45]:
```
df['processed_text'] = df["Description"].apply(preprocess)
df
```

[45]:
```
                                          Description  Emotion  \
0                             i didnt feel humiliated  sadness
1       i can go from feeling so hopeless to so damned…  sadness
2        im grabbing a minute to post i feel greedy wrong    anger
3       i am ever feeling nostalgic about the fireplac…     love
4                                  i am feeling grouchy    anger
```

```
…                                                  …      …
15995  i just had a very brief time in the beanbag an…  sadness
15996  i am now turning and i feel pathetic that i am…  sadness
15997                   i feel strong and good overall      joy
15998  i feel like this was such a rude comment and i…    anger
15999  i know a lot but i feel so stupid because i ca…  sadness

       Emotion_num                                  processed_text
0                1                              not feel humiliate
1                1             feel hopeless damned hopeful care awake
2                2                m grab minute post feel greedy wrong
3                4              feel nostalgic fireplace know property
4                2                                    feel grouchy
…             …                                                  …
15995            1          brief time beanbag say anna feel like beat
15996            1   turn feel pathetic wait table sub teaching degree
15997            0                            feel strong good overall
15998            2                     feel like rude comment m glad t
15999            1                        know lot feel stupid portray

[16000 rows x 4 columns]
```

2 Train-test split

[46]:

```python
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(df['Description'],␣
 ↪df['Emotion_num'], test_size=0.2, random_state=42)
```

3 KNN

[47]:

```python
# KNN
knn = Pipeline([
    ('tfidf', TfidfVectorizer()),
    ('classifier', KNeighborsClassifier())
])
knn.fit(X_train, y_train)
knn_y_pred = knn.predict(X_test)
```

[48]:

```python
print("Classification Report:\n", classification_report(y_test, knn_y_pred))
```

```
Classification Report:
               precision    recall  f1-score   support

           0       0.66      0.87      0.75      1021
           1       0.73      0.82      0.77       946
           2       0.76      0.61      0.68       427
           3       0.77      0.52      0.62       397
           4       0.77      0.35      0.48       296
           5       0.64      0.30      0.41       113

    accuracy                           0.71      3200
   macro avg       0.72      0.58      0.62      3200
weighted avg       0.72      0.71      0.69      3200
```

4 Logistic Regression

[49]:

```
# Logistic Regression
lr = Pipeline([
    ('tfidf', TfidfVectorizer()),
    ('classifier', LogisticRegression())
])
lr.fit(X_train, y_train)
lr_y_pred = lr.predict(X_test)
```

[50]:

```
print("Classification Report:\n", classification_report(y_test, lr_y_pred))
```

```
Classification Report:
               precision    recall  f1-score   support

           0       0.79      0.96      0.87      1021
           1       0.87      0.94      0.90       946
           2       0.90      0.77      0.83       427
           3       0.85      0.70      0.77       397
           4       0.89      0.55      0.68       296
           5       0.88      0.43      0.58       113

    accuracy                           0.84      3200
   macro avg       0.86      0.73      0.77      3200
weighted avg       0.85      0.84      0.83      3200
```

5 Multinomial Naive Bayes

[51]:

```
# Multinomial Naive Bayes
nb = Pipeline([
    ('tfidf', TfidfVectorizer()),
    ('classifier', MultinomialNB())
])
nb.fit(X_train, y_train)
nb_y_pred = nb.predict(X_test)
```

[52]:

```
print("Classification Report:\n", classification_report(y_test, nb_y_pred))
```

```
Classification Report:
               precision    recall  f1-score   support

           0       0.55      0.99      0.71      1021
           1       0.69      0.90      0.78       946
           2       0.91      0.17      0.29       427
           3       0.93      0.11      0.19       397
           4       1.00      0.01      0.01       296
           5       0.00      0.00      0.00       113

    accuracy                           0.62      3200
   macro avg       0.68      0.36      0.33      3200
weighted avg       0.71      0.62      0.52      3200
```

6 Random Forest

[53]:

```
# Random Forest
rfc = Pipeline([
    ('tfidf', TfidfVectorizer()),
    ('classifier', RandomForestClassifier(random_state=42))
])
rfc.fit(X_train, y_train)
rfc_y_pred = rfc.predict(X_test)
```

[54]:

```
print("Classification Report:\n", classification_report(y_test, rfc_y_pred))
```

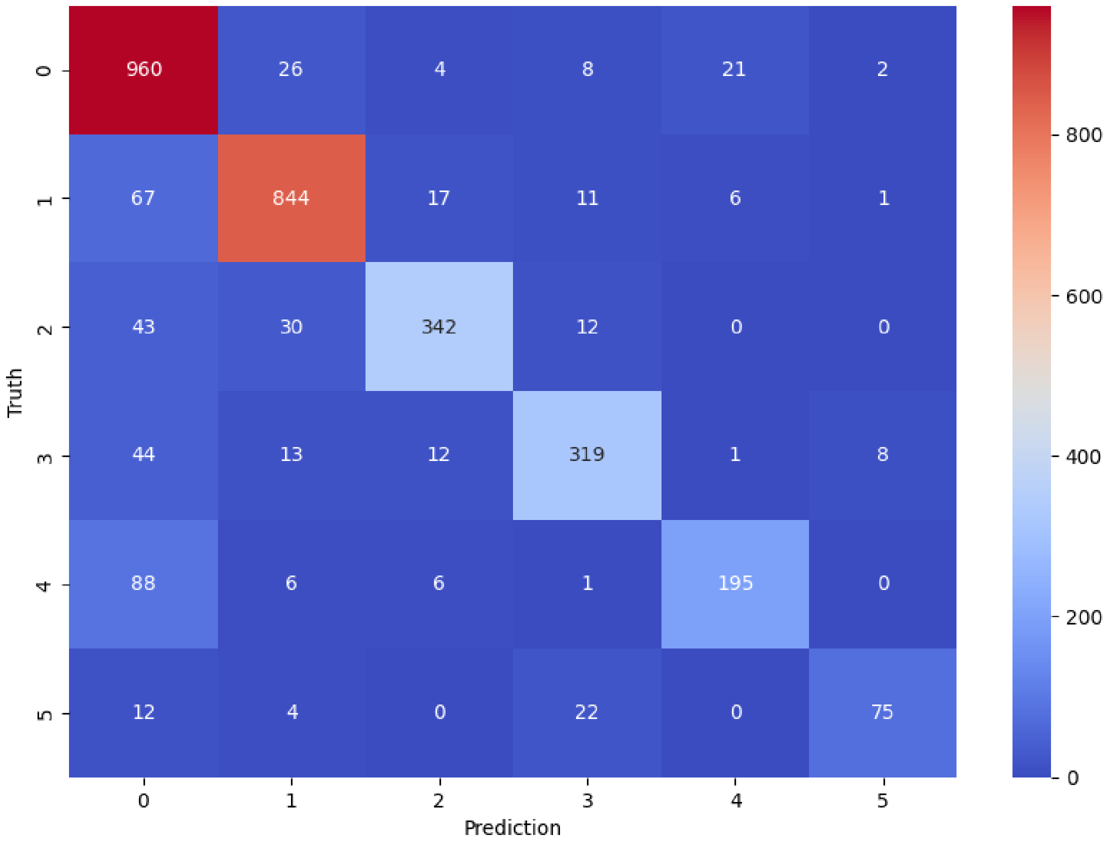
```
Classification Report:
               precision    recall  f1-score   support

           0       0.79      0.94      0.86      1021
           1       0.91      0.89      0.90       946
           2       0.90      0.80      0.85       427
           3       0.86      0.80      0.83       397
           4       0.87      0.66      0.75       296
           5       0.87      0.66      0.75       113

    accuracy                           0.85      3200
   macro avg       0.87      0.79      0.82      3200
weighted avg       0.86      0.85      0.85      3200
```

7 Confusion Matrix Heatmap for Random Forest

```
[56]: cm = confusion_matrix(y_test, rfc_y_pred)
      cm
```

```
[56]: array([[960,  26,   4,   8,  21,   2],
             [ 67, 844,  17,  11,   6,   1],
             [ 43,  30, 342,  12,   0,   0],
             [ 44,  13,  12, 319,   1,   8],
             [ 88,   6,   6,   1, 195,   0],
             [ 12,   4,   0,  22,   0,  75]])
```

```
[58]: # Plot confusion matrix
          plt.figure(figsize=(10, 7))
          sns.heatmap(cm, annot=True, fmt='d', cmap='coolwarm')
          plt.xlabel('Prediction')
          plt.ylabel('Truth')
          plt.show()
```


Truth
Prediction